

Erosion and Sedimentation in the Cuyahoga River Watershed



Guide #7 2005

Erosion and sedimentation are two different but interrelated processes.

- **Erosion** is the wearing away and removal of soil from the earth's surface by wind, ice and water.
- **Sedimentation** is the process of depositing the soil suspended from the water and air.



Erosion & Sedimentation are Natural Processes

Natural, or geologic, erosion and sedimentation occur at a relatively slow rate and have been a major factor in shaping our region. Our productive farmlands, the Cuyahoga River Valley and Lake Erie are all products of natural erosion and sedimentation. A natural rate of erosion allows streams and lakes to manage incoming sediment, which is an important factor in developing and maintaining a balanced and healthy ecosystem.

Excessive Sediment is a Major Pollutant

Erosion and sedimentation rates have accelerated to harmful levels by our urbanizing land use activities. Today accelerated rates of erosion account for the majority of sediment generated today and is now considered a major pollutant in the Cuyahoga River and Lake Erie.



The Cuyahoga River has the highest sediment load for its size compared to other Lake Erie tributaries (Source: *Water Quality Lab, Heidelberg College*). Every year, approximately 187,000 tons of sediment are generated and swept down to the mouth of the Cuyahoga River, equaling enough sediment to fill nearly 3,100 dump trucks. Every year nearly 350,000 cubic yards of sediment needs to be dredged from the river to allow for the movement of deep draft freighters. This amount of sediment entering our river system affects water quality, aquatic life and community cleanup costs.

The Cuyahoga River Watershed contains soils that are susceptible to relatively high rates of erosion. Poorly managed land disturbances, which lack erosion and storm water controls, and encroach upon riparian corridors, hasten the rate of erosion and sedimentation to damaging and costly levels.

Poorly Managed Development Accelerates Erosion and Sedimentation

Soil Erosion is Influenced by 4 Main Factors:

- ◆ *Soil Type*- a soil's ability to resist removal
- ◆ *Topography*- the shape of slopes in a watershed affect runoff rates
- ◆ *Vegetative Cover*- the amount and type of plants present to protect soil
- ◆ *Climate*- the amount of rain, wind and ice that occurs

Upstream Problems, Downstream Consequences

The principal effects that urban activities have on erosion rates are:

- ◆ Removing protective vegetation and exposing soils to precipitation and surface runoff;
- ◆ Changing topography, which alters storm water patterns and affects stream flow volumes & energy.



Poorly Managed Construction Sites - Stripping off protective vegetation exposes the soil to the forces of erosion. Construction sites lacking effective erosion and sediment controls upstream, cause sediment to wash off site, clogging streams and community storm sewers downstream. This increases flooding problems and community costs of sediment and debris clean up.

Development in Riparian Corridors – Removing riparian (streamside) vegetation and its functions accelerates stream flow and stream bank erosion both on-site and in downstream areas. Communities lacking an effective riparian setback ordinance increase the risk of flooding and erosion damage to property owners. This exposes communities to damage claims from impacted downstream landowners.



Increased Impervious Coverage - Larger, more frequent storm water discharges that accompany land development overwhelm a stream's historic shape. Without proper storm water management in upstream areas, channels downstream erode at faster rates. Accelerated bank erosion passes even more sediment downstream.

The consequences of poorly managed land use activities creates additional costs to watershed communities. These activities are occurring throughout the watershed, adding a widespread burden to improve community efforts in managing land use.

Accelerated Erosion & Sediment Affects Community Resources



Lower Cuyahoga before and after a rainstorm



Effects on our Natural Resources

- ◆ **Transports Harmful Levels of Pollutants** Sediment carries trace metals and phosphorus into our waterways. These pollutants contribute to increased water treatment costs, fish consumption advisories and expand oxygen depleted “anoxic zones” commonly called “dead zones” in Lake Erie.
- ◆ **Smothers Stream Bottoms** Sediment degrades fish habitat and alters vegetation patterns. This impairs fish populations and damages aquatic insects, which act as important food sources for sport fish.
- ◆ **Reduces Populations of Sensitive Sport Fish** Suspended sediment reduces visibility and damages fish gills, affecting the ability of fish to feed and breathe. Pollution sensitive sport fish, such as bass and trout are often replaced with more pollution tolerant and less popular bullheads and white suckers.



Effects on our Economic Resources

- ◆ **Causes of Property Damages and Clean up Costs** Large sediment loads have clogged portions of Big Creek and culverts within the stream requiring a \$6.7 million dollar clean up project. This project, which includes portions of Cleveland, Brooklyn and Parma, will help alleviate chronic flooding problems and damage experienced by nearby property owners.
- ◆ **Increases Drinking Water Supply Costs** Sediment reduces Akron’s reservoir storage volumes and increases its treatment costs. Sediment deposits are located where vegetation is growing. More than 14% of Lake Rockwell, 11% of East Branch and an unmeasured amount of LaDue Reservoir have been lost. Nutrients carried by soil cause accelerated weed growth in the river and reservoirs. This results in disinfection by-products and taste and odor compounds. Some of these by-products such as tri-halomethanes and haloacetic acids are thought to cause cancer (see Brochure #5 “Protecting Our Drinking Water”).
- ◆ **Contributes to Dredging and Disposal Costs** With shrinking Federal support, new regulations require local communities to pay 35% of dredging and disposal costs. Annually, 350,000 cubic yards of sediment are dredged from Cleveland’s navigation channel at a cost of nearly \$2 million. Sediment sources are from upstream communities; who should pay?

Erosion and sediment control must be a regional responsibility, not a burden for downstream communities. Our region’s water resources need to be viewed as both an ecological and economic resource worthy of investment.

Managing Erosion & Sediment in Your Local Stream



Managing Erosion & Sediment

An effective erosion and sediment control program integrates existing watershed features and coordinates local technical support for enforcement measures among up and downstream communities.



Integrate Watershed Features to Manage Storm Water and Erosion

The most cost effective way for communities to manage storm water and erosion is by establishing ordinances to protect important watershed features.

- ◆ **Headwater Streams** - gather and manage the volume and energy of storm water
- ◆ **Floodplains** - function as storm water release valves
- ◆ **Riparian Corridors** - stabilize stream banks and absorb flood waters
- ◆ **Wetlands** - absorb and slow the speed of storm water and capture suspended sediment
- ◆ **Impervious Cover Management** - reduce or shift future impervious cover to areas suitable for development, which helps protect watershed features.
- ◆ **Tree Canopy Management** - a healthy tree canopy controls runoff at the source by intercepting and storing rainfall, reducing runoff volumes and erosion of watercourses, as well as delaying the onset of peak flows.

Coordinate Erosion & Sediment Management

Utilize Existing Local Support: Strengthen relationships with local Soil and Water Conservation Districts (SWCD). This can help communities maintain compliance with Ohio EPA requirements.

Program Coordination & Enforcement: Communities benefit by coordinating regionally on construction site management. Multi-community partnerships can garner more financial and technical support on soil erosion, sediment control and water quality protection. This helps local governments save money by delivering more efficient community services.

Consider Construction Site Performance Bonds: A performance bond is a financial tool used to guarantee that in the event of a developer or contractor defaulting, funds are available to finish the construction and to ensure properly functioning Best Management Practices (BMPs).

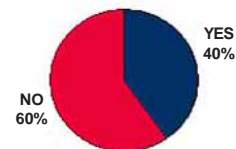
Community Erosion & Sediment Survey in the Cuyahoga River Watershed

Adopted Erosion Controls



A recent survey by the RAP suggests that of the communities that responded, 18% do not have erosion & sediment controls. Of the communities that have adopted ordinances, 48% do not rely on performance bonds. **Erosion and sediment ordinances are only effective to the degree they are enforced.** Adopting the use of performance bonds is an important enforcement measure that helps deliver a successful ordinance, community services and protects our streams.

Adopted Performance Bonds



For more information on Erosion and Sediment controls contact the AHR Partners



This brochure is part of a series of guides being prepared by the Cuyahoga AHR Partners to help local officials and interested citizens understand the issues and benefits of local watershed stewardship. Each guide is designed to cover a single topic related to watersheds and stream sustainability. The complete series will comprise a Watershed Handbook for Cuyahoga watershed communities

Cuyahoga River RAP
1299 Superior Avenue
Cleveland, Ohio 44114
(216) 241-2414 Ext. 307
www.CuyahogaRiverRAP.org